smartoptics

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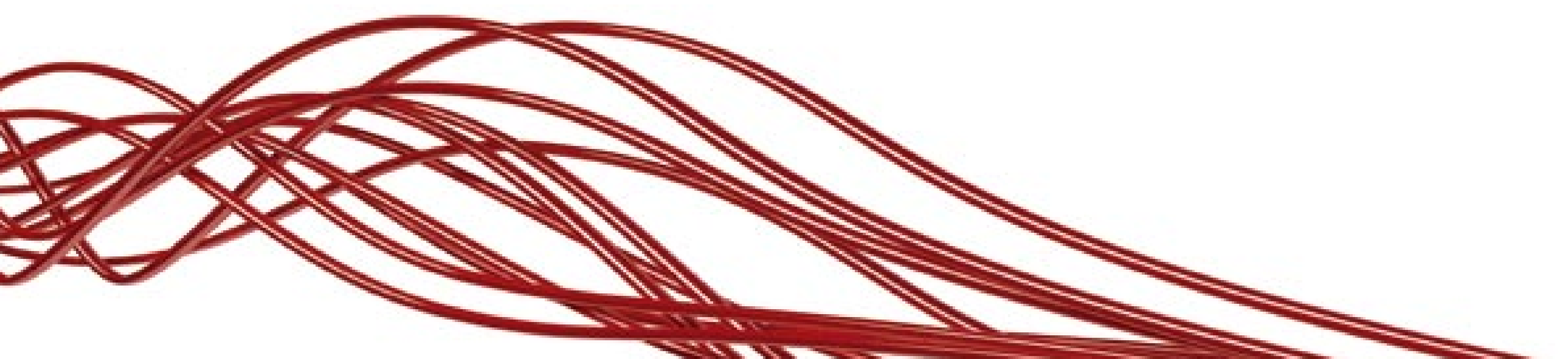


m:series

A completely new Optical Transmission Platform

SmartOptics launches the industry’s first next generation active-embedded WDM platform. The m:series is a fully featured 1U distance extension platform combining all the features of a traditional DWDM system with the simplicity and cost effectiveness of an embedded WDM system.

True Protocol transparent Distance Extension platform

- m:series transports 10G traffic up to 200km without the need for additional DWDM equipment
- All traffic from 100Mbps to 10Gbps handled in a very simple and cost effective way
- m:series is 16G, 40G and 100G ready

Fully Featured Distance Extension platform

- m:series contains all required Mux/Demuxes, Amplifiers (EDFAs), Dispersion Compensation (DCMs), Optical surveillance (OSC) & monitoring

Simple Operation

- Simple plug and play platform up and running within minutes
- No complicated installation procedures or configurations necessary

Robustness

- Redundant, hot pluggable power supplies exist for both AC and DC power
- Network management board can be serviced in the field without traffic interruption

Channel Density

- 4 and 16 channel versions exist which can be seamlessly upgraded up to 32 channels depending on current and future traffic requirements

The benefits are clear to see.

Compact Footprint

- All m:series modules are 1U x 19” form factor

Introduction to WDM

Wavelength Division Multiplexing (WDM) technology multiplies fiber capacity by multiplexing optical light signals at different wavelengths onto a single optical fiber. The technology is well standardized in the ITU G.695 and G.694 recommendations and widely used in datacom and telecom networks.

Due to the physical nature of the optical fiber, the signals at WDM wavelengths are completely independent from each other and data streams with different line-rates and protocols can be transported simultaneously on the same fiber.

WDM exists in two flavours:
• Coarse WDM (CWDM) allows for a maximum of 20 channels between 1270nm and 1610nm with 20nm channel spacing.

• Dense WDM (DWDM) in its most common implementation allows for a maximum of 40 channels between 1554.54nm and 1586.62nm with 100GHz (about 0.8nm) channel spacing.

Two key components are required to build a WDM network:
Multiplexer/Demultiplexer which combines and splits signals at the different WDM wavelengths on the same fiber.

Optical transmitter which generates light at exactly a specific WDM wavelength.
The transmitter can be integrated on the transponder card of a transmission platform or packaged together with the receiver and support electronics in an optical transceiver (SFP, SFP+. XFP. Etc.).

Why Embedded WDM?

Optical transceivers are increasingly supporting the functionality found in transmission systems. Enhanced digital diagnostics now allow all optical parameters and alarms to be reported directly by the transceiver, making the transponders traditionally used in optical transport systems redundant. This ability to replace expensive and complicated parts of the transmission system is gaining more momentum and will continue to do so with the introduction of tunable pluggable optics.

Embedded WDM is where a pluggable WDM transceiver is directly connected in the customers' switches and routers and then to a passive multiplexer/demultiplexer. Transponder cost can therefore be removed. In addition, this approach significantly reduces the footprint and power consumption of the system, while

simultaneously increasing the reliability due to fewer components required. The result is the simplest, most cost-effective and reliable solution to meet increased capacity requirements in access and metro networks.

Typical transmission distances between the terminal equipment span from just a few kilometers to 120 km at Gigabit Ethernet (GbE) data rate. WDM embedded networking has been successfully used in enterprise and carrier access networks for many years now and is increasingly gaining in popularity.

The limitations of embedded WDM

The current migration from GbE and 2G/4G Fibre Channel data rates to 10G/100G Ethernet and 8G/16G Fibre Channel limits the achievable distance in embedded networks. This is due to power budget and dispersion limitations at these higher data rates. The typical reach for an embedded WDM network operating at GbE is up to 120km, whereas it is difficult to reach beyond 60km at 10GbE using the current embedded approach.

Furthermore, in its current implementation, Embedded WDM networking relies solely on the optical transceiver to monitor the status of the optical layer (power level, LOS, wavelength). However, there are situations when the transceivers can be installed in different switches, controlled by different software, even by different owners, which can make information gathering awkward. In many cases, this is a minor trade-off, considering the vast advantages of embedded networking. However, it would be possible to significantly increase the field of use for this technology by creating a single demarcation interface where all information relevant for the WDM operation could be accessed by the customer.

The next generation Embedded WDM Network is here.

SmartOptics m:series platform addresses these issues with latest optical technology, combining the simplicity and robustness of embedded networking, with enhanced networking performance.

In a typical case, multiple10G signals need to be transported over a distance of 100 km. The optical 10G transceivers have limited dispersion and power budget characteristics that restricts the reach of the system to approx 80 km. Insertion losses in optical multiplexers, demultiplexers and dispersion compensation modules further reduce the available power budget. Optical amplification is therefore required to compensate for these additional losses.

The first consequence of this is to reduce the scope for CWDM embedded technology, since CWDM is not suitable for amplification. The next generation embedded WDM network is most likely to be DWDM in order to provide for longer reaches at higher data rates.

The second consequence is to increase the requirement on the embedded platform. Exact control of the optical power for each channel is required in order to optimize the power budget on a system level. Redundant and field serviceable power supply has to be provided. Software has to be designed. Customers have to be trained.

Most solutions proposed by traditional WDM transport vendors are transponder based systems relying on Optical-Electrical-Optical (OEO) conversion. These solutions require additional subsystems providing amplification, dispersion compensation, and complex software for the management and customer interface. In a data-center environment the physical size and power consumption of a typical DWDM system is then larger than that of the switching equipment.

1 Ultra compact building practice

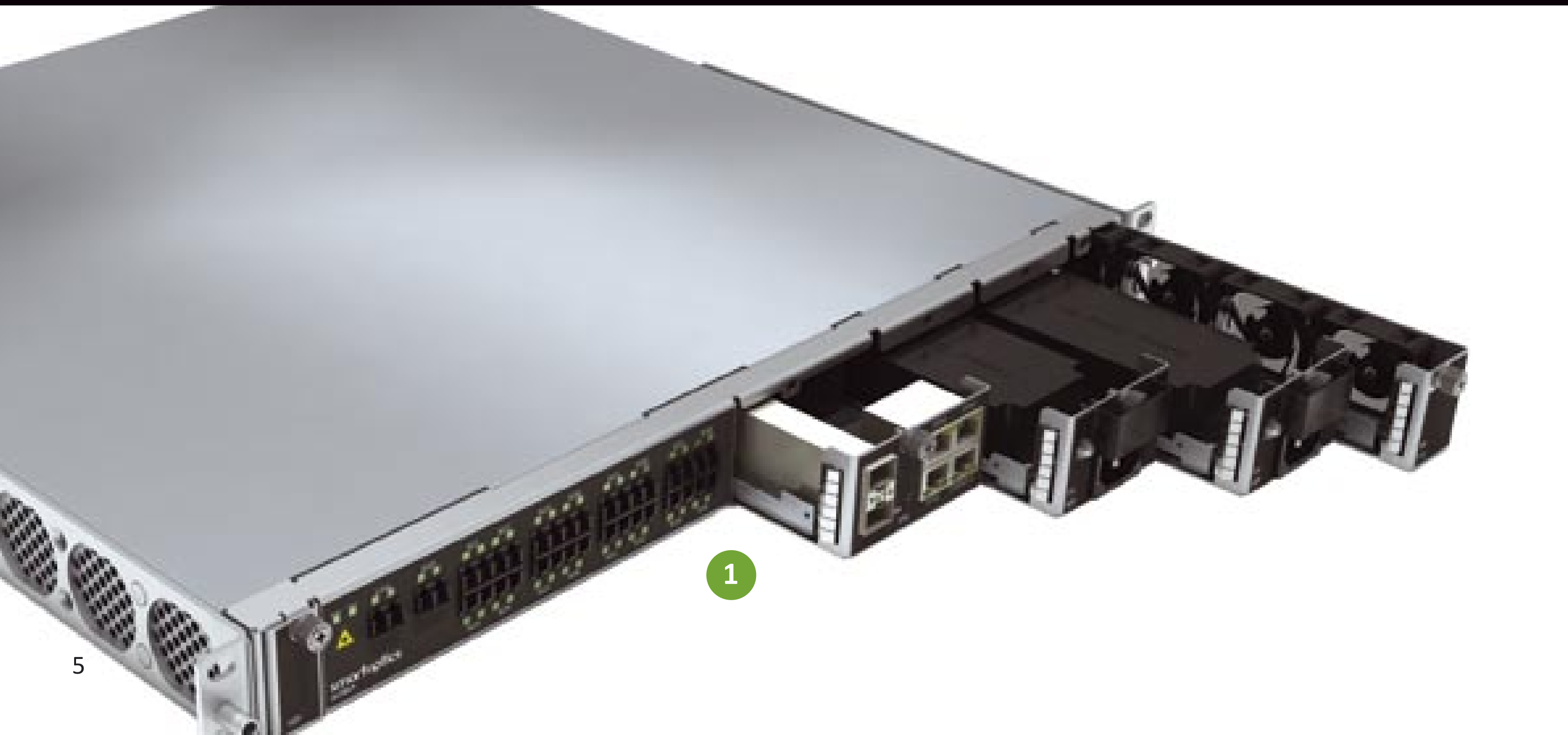
The m:series is a 1U plug and play pizza box design incorporating all needed WDM functionality including management, amplification, dispersion control and variable optical attenuation, all in a single unit.

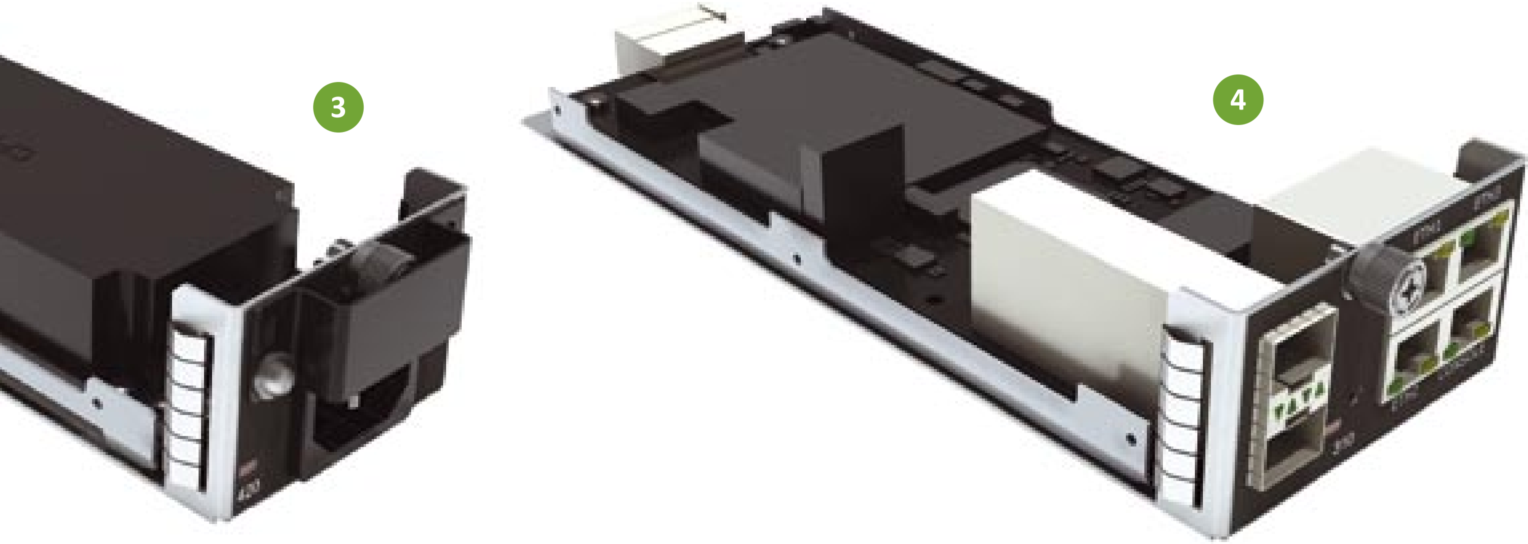
2 Fan PIU

The fan unit, m110, is designed to insure a suitable air flow inside the chassis. This PIU supports four low noise, high quality fans. The speed of the fans is automatically set by the system, based on ambient conditions. The status of the fans is continuously monitored and an alarm is generated in case of performance degradation. The alarm alerts the user who can then exchange the unit in good time and avoid any negative effect on the network. A red LED allows the faulty PIU to easily be spotted in the rack.

3 Power supply PIU

The power supplies are redundant and hot-swappable. Two versions exist: the m410 is designed for -48 VDC input and is used with batteries for power backup. The m420 is designed for 120/240 VAC input and can be fed directly from the power grid. The two PSU types can be used simultaneously in the same chassis. The complete chassis is fully functional with only one PSU, but it is strongly recommended to have two PSUs per chassis for redundancy. The PSUs are continuously monitored by the system and an alarm is generated in case of performance degradation. The alarm alerts the user who can then exchange the unit in good time and avoid any negative effect on the network. A red LED allows the faulty PIU to easily be spotted in the rack.





4 Network Management PIU

The NMB PIU, m310, manages the functionality of the system. It is also the interface through which the customer can access and control the parameters of the system. The m:series requires an NMB to operate normally. However, if the PIU is removed or should otherwise be nonfunctional for a short period of time, the existing data traffic on the network will not be affected.

The NMB presents four RJ45 ports, two SFP ports, a reset button and a signaling LED on the front side. One of the RJ45 ports is reserved for a console interface through which the user can access directly via a PC. The remaining three RJ45 ports and the two SFP ports are interconnected through an Ethernet switch. It is possible to access the unit remotely via Internet through any of these ports.

These additional Ethernet ports allow the customer to access third part monitoring systems, such as Ethernet controlled UPS systems or environmental monitoring systems.

The Ethernet switch on the NMB also has two extra ports interfacing internally in the chassis through the electrical connector of the PIU. These two ports can be used to activate the Optical Surveillance Channel (OSC) which is a standard feature of the m:series. The 1510nm CWDM band is used by the system to convey management information through the optical fiber. This feature allows several chassis to talk to each other across a network. It also allows management information for the whole site to be remotely accessed, without requiring local internet access. Other wavelengths for the OSC are readily available. The function can also be shut down if required.

The NMB supports hot software download, which makes it possible to remotely upgrade the software without affecting the network functionality.

Optical Transmission Sub-system

All the optical functionality of the platform is implemented in the chassis and is not pluggable. The architecture supports VOA arrays, mux/demux, DCM, EDFA and optical monitor. These functional elements can be put together in different combinations in order to meet a given network requirement.

The VOAs are used to balance the optical power levels of different DWDM channels. This is the key to optimizing the power budget of the system.

The EDFAs are used to amplify the optical signals both on the transmit side as a booster, and on the receive side as a preamplifier.

Fiber-Bragg-Grating DCMs are being used to extend the dispersion limits of the optical transceivers.

The SmartOptics proprietary state machine implemented on the NMB insures that all these optical elements work seamlessly, without requiring delicate and lengthy set up sequences neither during initial installation nor when adding new channels at a later stage.

m:series Technical Specifications

System	
Topology:	Point-to-Point
Transport Network:	Metro WDM / dark fiber
Approvals:	CE Class B, RoHS-6
Standardization:	Long term storage according to ETSI EN 300 019-1-1 V2.1.4 Class 1.1
	"Weather protected, partly temperature controlled storage locations"
	Transport according to ETSI EN 300 019-1-2 Class 2.3: Public transportation
	Operation according to ETSI EN 300019-1-3 V2.3.2 Class 3.1: Temperature controlled locations
	Earthquake according to ETSI EN 200 019-1-3 V2.3.2 §5.6
Operating Temp:	-5° C to +45° C
Size:	45 mm (H) x 440 mm (W) x 450 mm (D)
Weight:	12 kg
Channel count:	16 DWDM channel (ITU921 to ITU968) plus16 channel upgrade option (ITU943 to ITU958)
	4ch DWDM channel (ITU 931 to ITU934) plus 4 channel upgrade option (ITU936 to ITU939)
Supported protocols:	Fast Ethernet to 10G Ethernet
	1/2/4/8G Fiber Channel
	40Gbps ready
	16G Fiber Channel ready
Eye Safety:	Automatic laser shut down
Maximum reach:	120km, 160km, 200km
Network Management	
Management Ports:	3x10/100Base-T RJ-45,
	2x 100Base-FX SFP
	1xconsole port RJ45
Software upgrade:	Traffic hitless - dual image
Protocols:	CLI (SNMP and GUI to be implemented in later releases)
DCN:	LAN/WAN/VPN
Management Channel:	Optical Supervisory Channel (OSC) at 1510nm (standard)
Visual Indicators:	LED status indicators for client ports, line interfaces, power, shelf
Power Supply	
Characteristics:	90-254 VAC, -48 VDC, <68 Watts
Redundancy:	Single or dual PSU, hot pluggable
Ordering information	
16+16 channel m:series	
m1601-120:	16 + 16 ch upgrade port m:series, 921-936, 120km, 32dB
m1601-160:	16 + 16 ch upgrade port m:series, 921-936, 160km, 38dB
m1600:	16 ch m:series, 943-958, upgrade for m1601
4+4 channel m:series	
m1401-160:	4 + 4 ch upgrade port m:series, 931-934, 160km, 38dB
m1401-200:	4 + 4 ch upgrade port m:series, 931-934, 200km, 45dB
m1400:	4 ch m:series, 936 -939, upgrade for m1401
m:series Plug In Units	
m420:	AC Power Supply
m410:	DC Power supply
Optical transceivers	The m:series platform is approved for all SmartOptics DWDM transceivers types:
SO-SFP-L120D-Dxxxx:	SFP, 1.25/2.5 Gbps GigE/FC, DWDM, SM, DDM, 30dB, 120km@GigE
SO-SFP-L300D-Dxxxx:	SFP, 1.25/2.5/4G Gbps GigE/FC, DWDM, SM, DDM, 32dB, 300km@GigE
SO-SFP-MR200D-Dxxxx:	SFP, 100Mbps-2.7Gbps, Multirate, DWDM, SM, DDM, 30dB, 200km
SO-SFP-10GE-ER-Dxxxx:	SFP+, 10GBase-ER, DWDM, SM, DDM, 14dB, 40km
SO-SFP-10GE-ZR-Dxxxx:	SFP+, 10GBase-ZR, DWDM, SM, DDM, 23dB, 80km
SO-SFP-8GFC-ER-Dxxxx:	SFP+, 8/4/2/1 Gbps FC/FICON, DWDM, SM, DDM, 14dB, 40km
SO-SFP-8GFC-ZR-Dxxxx:	SFP+, 8/4/2/1 Gbps FC/FICON, DWDM, SM, DDM, 23dB, 80km
SO-XFP-ER-Dxxxx:	XFP, 10GBase-ER, 10.3125 Gbps, DWDM, SM, DDM, 14dB, 40km
SO-XFP-ZR-Dxxxx:	XFP, 10GBase-ZR, 10.3125 Gbps, DWDM, SM, DDM, 24dB, 80km
SO-XFP-E-OC192-IR2-Dxxxx:	XFP, S-64.2b, 9.5-11.1 Gbps, DWDM, 13dB, 40km
SO-XFP-Z-OC192-LR2-Dxxxx:	XFP, L-64.2, 9.5-11.1 Gbps, DWDM, 24dB, 80km
SO-X2-ZR-Dxxxx:	X2, 10GBase-ZR, 10.3125 Gbps, DWDM, DDM, 24dB, 80km
SO-XENPAK-ZR-Dxxxx:	XENPAK, 10GBase-ZR, 10.3125 Gbps, DWDM, DDM, 23 dB, 80 km

SmartOptics designs and markets all types of fibre optical transmission products. Headquarted in Oslo, Norway, we serve Storage, Data and Telecom Networks worldwide with a unique and cost effective portfolio of optical transmission components & systems.

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